REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-34 are currently pending in the present application, Claims 1-5, 9-22, and 26-34 having been amended by way of the present amendment. No new matter has been added.[1]

In the outstanding Office Action, Claims 1, 3, 4, 12, 14-16, 18-21, and 31-33 were rejected under 35 U.S.C. § 102(e) as anticipated by Richardson et al. (U.S. Pat. No. 6,831,963, hereinafter "Richardson"); Claims 2, 5, 9, 10, 17, 22, 26, 27, and 34 were rejected under 35 U.S.C. § 103(a) as unpatentable over Richardson; Claims 6-8 and 23-25 were rejected under 35 U.S.C. § 103(a) as unpatentable over Richardson in view of Hertz et al. (U.S. Pat. No. 6,002,744, hereinafter "Hertz"); and Claims 11, 13, 28, and 30 were rejected under 35 U.S.C. § 103(a) as unpatentable over Richardson in view of Kumar et al. (U.S. Pat. No. 5,331,172, hereinafter "Kumar").

With regard to the rejection of Claims 1, 3, 4, 12, 14-16, 18-21, and 31-33 under 35 U.S.C. § 102(e), Applicant respectfully traverses the rejection.

Claim 1 has been amended to recite a method for generating a plasma as a source of radiation by irradiating a pulsed laser on material, wherein

> droplets are generated from liquid including fine particles,
> a density of particles in said droplets is increased by vaporizing a solvent with an infrared heating source, including using weak laser irradiation,
> a particle-cluster in which large number of fine particles aggregate is formed after condensation of said droplets, and
> a pulsed laser for generating a plasma irradiates said particle-cluster.

[1] The amendments to Claims 1, 3, 18, and 20 find support in the specification at least on page 9 in the paragraphs beginning at line 7, and at line 19, on page 13 in the paragraphs beginning at line 10, and at line 14.

To the extent the Examiner feels Richardson is relevant to amended Claim 1, the following remarks are provided for the Examiner's consideration.

While Richardson may describe generating a plasma by irradiating a high peak power laser on droplets which include various materials, Richardson is silent regarding a discussion of particles and particle-clusters. Indeed, the only recitation of the word "particle" in Richardson occurs once, at 2nd line of col. 4, where Richardson states that "metallic solutions can include mixtures of metallic nano-particles in liquids."

Applicant respectfully submits that while the mixing of nano-particles in a liquid for forming droplets may be known to one of ordinary skill in the art, a person or ordinary skill in this field would not know to use aggregated particles, because, in order to avoid clogging of a nozzle to eject the liquid by a large secondary particle which is formed by aggregation of fine particles, "particles mixed in the liquid" should not aggregate. Indeed, a "particle-cluster" is absolutely different from "particles mixed in a liquid."

By way of background, and as discussed in Applicant's specification on page 4 in the paragraphs beginning at lines 7 and 18, the use of droplets has been studied in the 1970s and 1980s. In fact, generation of a laser plasma by shooting a liquid mixed with a metallic solution was studied already in the late 1990s. However, in all previous technologies, including both Richardson and Hertz, a main pulse laser irradiates droplets directly, as seen in Fig. 2 of Richardson. In this method, as explained in the Applicant's specification and as seen in Figs. 1 and 2, one cannot get rid of the "solid-density core" surrounded by an ultra-low density plasma. The core contains far larger mass than that in the plasma, and this solid density core is the source of a tremendous amount of contamination. The fatality of shooting a laser directly on droplets is explained on page 5 in the paragraphs beginning at lines 15 and 28 and on page 6 in the paragraphs beginning at line 4 of Applicant's specification.

As seen in Applicant's Fig 1, because only a very thin surface of a thickness of several micrometers of sphere target can be changed to a plasma during a pulse irradiation, it is very difficult to heat particles in a droplet by the laser. Therefore, the use of particles instead of a metal solution will have a harmful effect, unless the surface of the droplet is covered not by a *solvent*, but by *particles*.

As described in Applicant's specification, droplets are not directly illuminated by a main pulse for plasma generation. Prior to the illumination by the main laser shot, droplets are heated with a help of some heating means including infrared rays or a very weak laser to vaporize a solvent to increase density of particles. Vaporization of a solvent allows fine particles to aggregate to form a particle-cluster which is a secondary particle formed by large number of fine particle each having a sub-micron diameter not tens nanometer.

The difference between a "droplet including particles" and a "particle-cluster" can be understood with reference to Applicant's Figs. 3 and 4. As seen in Fig. 3, liquid 4 including fine particles 3 is ejected through a nozzle 2 and droplets 5 including particles 3 are generated, as in previous technologies. However, one new feature of the claimed invention, as shown in Fig. 4, is that a solvent of a droplet 5 is vaporized and the diameter of the droplet reduces as shown by symbol 7, and the particle-cluster 8 is formed.

When the density of particles is increased by vaporizing a solvent, the main laser can heat particles to generate a plasma without being blocked by the solvent. Furthermore, as shown in Applicant's Fig. 5, constituent particles in the cluster 8 can be dispersed by giving some shock prior to the irradiation by the main pulse, and a plasma which does not have a high density core can be generated by irradiating the main laser 12 on particles dispersed uniformly in a wide space. Thus, the contamination issue is dramatically relieved.

Accordingly, for all of the above reasons, Richardson cannot and indeed, does not disclose or suggest "a method for generating a plasma as a source of radiation by irradiating a pulsed laser on material," as defined in amended Claim 1.

Therefore, independent Claim 1 (and the claims dependent therefrom) is believed to patentably define over Richardson.

Independent Claims 17, 18, and 34, while differing in scope and statutory class from Claim 1, patentably define over Richardson for substantially the same reasons as Claim 1. Accordingly, it is respectfully submitted that Richardson does not anticipate or render obvious the features of independent Claims 17, 18, and 34. Therefore, independent Claims 17, 18, and 34 (and claims dependent therefrom) are believed to patentably define over Richardson.

Regarding the rejection of Claims 2,5,9,10,17,22,26,27 and 34 as unpatentable over Richardson in view of undocumented assertions in the Office Action, it is noted that Claims 2,5,9,10,17,22,26,27 and 34 are dependent from Claims 1 or 18, and thus are believed to be patentable for at least the reasons discussed above. Further, it is respectfully submitted that the undocumented assertions in the Office action do not cure any of the above-noted deficiencies of Richardson. Accordingly, it is respectfully submitted that Claims 2,5,9,10,17,22,26,27 and 34 are patentable over Richardson in view of the undocumented assertions in the Office Action.

Moreover, regarding the above-noted undocumented assertions in the Office Action, M.P.E.P. § 2144.03 states that it is never appropriate to rely solely on common knowledge in the art without evidentiary support in the record, as the principal evidence upon which the rejection is based. Accordingly, Applicant traverses the 35 U.S.C. § 103(a) rejection based on the undocumented assertions in the Office Action for the reason that, without the temporal and structural context by which these features are known to the artisan, it is impossible to

conclude that it would be obvious for one of ordinary skill in the art at the time of the invention to combine those noticed features with the art of record. Indeed, the context by which these features are allegedly known might itself provide reasons to rebut a *prima facia* case of obviousness.

With further regard to dependent Claim 2, the Office Action asserts on page 4 that the claimed "method of cracking the particle-cluster to disperse aggregating particles prior to plasma generation," as recited in original Claim 2, would have been obvious to one of ordinary skill in the art.

However, Applicant respectfully submits that this assertion has no technical basis for the following reasons.

The flying time of droplets before being illuminated by a main laser shot after being ejected from a nozzle will be only several milliseconds (30 mm dived by 10m/sec is 3 msec). The liquid in the reservoir is supplied through a tube of several mm diameter to the nozzle of tens micron diameter. The traveling time in the tube (1 meter in length and several millimeters in diameter) is quite longer than traveling time of droplets by more than 4 orders of magnitude. If particles in a droplet could aggregate in a very short time of a few milliseconds after being ejected through the nozzle, owing to extremely long flying time in the tube, the liquid should be full of large diameter secondary particles formed by aggregation of fine particles before reaching the nozzle. A person of ordinary skill in the art would understand that suppression of generating secondary particles is crucially important in order to avoid clogging of a very thin diameter nozzle. For these reasons, particles in droplets generated from liquid jet will never aggregate, and a person of ordinary skill in the art would not know to crack a particle-cluster to disperse aggregating particles prior to plasma generation.

Indeed, Richardson is silent regarding the aggregation of particles in droplets. Moreover, Applicant respectfully submits that the concept of a "particle-cluster" is new in this field, as noted above. Accordingly, it is respectfully submitted that Claim 2 further defines over Richardson.

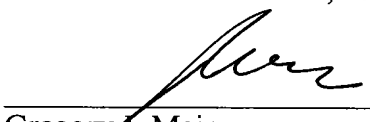
With regard to the rejection of Claims 6-8 and 23-25 as unpatentable over Richardson in view of Hertz, it is noted that Claims 6-8 and 23-25 are dependent from Claims 1 or 18, and thus are believed to be patentable for at least the reasons discussed above. Further, it is respectfully submitted that Hertz does not cure any of the above-noted deficiencies of Richardson. Accordingly, it is respectfully submitted that Claims 6-8 and 23-25 are patentable over Richardson and Hertz.

With regard to the rejection of Claims 11, 13, 28, and 30 as unpatentable over Richardson in view of Kumar, it is noted that Claims 11, 13, 28, and 30 are dependent from Claims 1 and 18, and thus are believed to be patentable for at least the reasons discussed above. Further, it is respectfully submitted that Kumar does not cure any of the above-noted deficiencies of Richardson. Accordingly, it is respectfully submitted that Claims 11, 13, 28, and 30 are patentable over Richardson and Kumar.

Consequently, in view of the present amendment and in light of the above discussions, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Gregory J. Maier
Attorney of Record
Registration No. 25,599

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/07)

BRADLEY D. LYTLE
REGISTRATION NO. 40,073